

REMARKS

In the above-identified outstanding Official Action, the Examiner:

(1) indicated that claims 13-18, 21-23 and 25-27 are canceled;

(2) indicated that newly submitted claims 35-41 are directed to an invention that is independent or distinct from the invention originally claimed, claims 35-41 are withdrawn from consideration as being directed to a non-elected invention since Applicant previously received an action on the merits for the originally presented invention, and the invention was constructively elected by original presentation for prosecution on the merits;

(3) rejected claims 1, 7, 8, 28, 29, 31 and 34 under 35 USC 102(e) as being anticipated by Hung et al.; and

(4) rejected claims 2-6, 9-12, 30, 32 and 33 under 35 USC 103(a) as being unpatentable over Hung et al. in view of Kim et al.

In response to Item 1 above, Applicant acknowledges that claims 13-18, 21-23 and 25-27 are canceled inasmuch as Applicant previously canceled certain of the original claims, modified other original claims to better define the present invention, and

added certain new claims to more clearly define the present invention.

In response to Item 2 above, Applicant acknowledges that claims 35-41 are withdrawn from consideration as being drawn to a non-elected invention, and Applicant respectfully reserves the right to prosecute non-elected subject matter in related applications.

In response to Item 3 above, Applicant has now amended independent claims 1, 31 and 34 to more clearly define the present invention with respect to the prior art of record.

Claim 1 of the present invention calls for, inter alia, "at least three elongate electrically conductive grasping elements each having first and second opposite ends, with said first ends attached to said substrate and making electrical connections with an alternating current source and said second ends projecting outwardly away from said substrate, whereby said second ends are free to be attracted or repelled relative to one another in response to application of alternating current to said elements".

Applicant believes that Hung et al. disclose an electrostatically controllable actuator having a stationary electrode and an actuating element separated from the stationary electrode by an actuation gap and having a conducting actuation

region, whereby when an actuation voltage is applied between the actuation region and the stationary electrode, the actuating element can be displaced as a result of electrostatic forces. The actuating elements of Hung et al. are essentially beams that extend parallel to a support that includes the stationary electrode. The flexible beam carries an electrode, so that when a voltage is applied between the electrode on the support and the electrode on the beam, an electrostatic force attracts the beam and causes it to be deflected toward the stationary support.

Thus, the device of Hung et al. lacks Applicant's three grasping fingers which are opened and closed relative to one another by the application of an alternating current source. Accordingly, independent claim 1 is believed to be in condition for allowance, and allowance thereof is respectfully requested.

Claims 7, 8, 28 and 29, which depend either directly or ultimately from independent claim 1, are believed to be in condition for allowance for at least the above-identified reasons. Accordingly, allowance of claims 7, 8, 28, and 29 is respectfully requested.

Claim 31 of the present invention calls for, inter alia, "a substrate, three elongate, fibrous, electrically conductive grasping elements projecting outwardly away from said substrate,

and three electrodes on said substrate configured to provide an oscillating voltage to each of said three elongate, fibrous, electrically conductive grasping elements, whereby to cause the free ends of said electrically conductive grasping elements to be attracted or repelled relative to one another."

As noted above, Hung et al. disclose an electrostatically controllable actuator having a stationary electrode and an actuating element separated from the stationary electrode by an actuation gap and having a conducting actuation region, whereby when an actuation voltage is applied between the actuation region and the stationary electrode, the actuating element can be displaced as a result of electrostatic forces. The actuating elements of Hung et al. are essentially beams that extend parallel to a support that includes the stationary electrode. The flexible beam carries an electrode, so that when a voltage is applied between the electrode on the support and the electrode on the beam, an electrostatic force attracts the beam and causes it to be deflected toward the stationary support.

Again, the device of Hung et al. lacks Applicant's three grasping fingers which are opened and closed relative to one another by the application of an alternating current source.

Accordingly, independent claim 31 is believed to be in condition for allowance, and allowance thereof is respectfully requested.

Claim 34 of the present invention calls for, inter alia, "a substrate, at least three fibrous electrically conductive grasping elements having first ends and second ends, the first ends in electrical connection with separate electrodes on the substrate, and the second ends projecting outwardly from the substrate, and an alternating current source in electrical connection with the separate electrodes on the substrate, each of said grasping elements separated from one another by a gap, whereby said second ends are configured to move in a direction to increase or decrease said gaps as a function of electrostatic attraction caused by alternating current applied to said electrodes."

Again, Hung et al. disclose an electrostatically controllable actuator having a stationary electrode and an actuating element separated from the stationary electrode by an actuation gap and having a conducting actuation region, whereby when an actuation voltage is applied between the actuation region and the stationary electrode, the actuating element can be displaced as a result of electrostatic forces. The actuating elements of Hung et al. are essentially beams that extend

parallel to a support that includes the stationary electrode. The flexible beam carries an electrode, so that when a voltage is applied between the electrode on the support and the electrode on the beam, an electrostatic force attracts the beam and causes it to be deflected toward the stationary support.

Again, the device of Hung et al. lacks Applicant's three grasping fingers which are opened and closed relative to one another by the application of an alternating current source. Accordingly, independent claim 34 is believed to be in condition for allowance, and allowance thereof is respectfully requested.

In response to Item 4 of above, Applicant has now amended independent claims 1 and 31 to more clearly define the present invention from the prior art of record as discussed hereinabove, and claims 2-6, 9-12 and 30 depend either directly or ultimately from independent claim 1, and claims 32 and 33 depend either directly or ultimately from independent claim 31.

The deficiencies of Hung et al. have been discussed above.

Turning next to Kim et al., Applicant believes that Kim et al. disclose a tweezer device having grasping elements made of a fibrous material. However, Applicant submits that the Examiner has no reasonable basis in fact for concluding that it "would have been obvious to one having ordinary skill in the art at the

time that the invention was made to modify the device of Hung et al. by providing grasping elements made of a fibrous material in order to provide remarkable mechanical toughness and electrical conductivity in view of the teachings of Kim et al." That conclusion by the Examiner is believed to be defective in that the actuating device of Hung et al. does not have grasping elements and modifying that device to provide it with grasping elements made of a fibrous material would render the device inoperative for its original disclosed purpose. Furthermore, the basic construction of the Hung et al. device is so different from the tweezer device of Kim et al. as to dispel any notion that it would be obvious to persons skilled in the art to modify the device of Hung et al. in a manner taught by Kim et al. so as to provide a grasping device as called for by Applicant's claims.

Furthermore, Applicant believes that Kim et al. do not teach or suggest Applicant's novel concept of utilizing at least three grasping fingers which are opened and closed by the application of alternating currents. As pointed out in Applicant's specification, having more than two grasping elements provides a measure of control that is not attainable by the two-finger device of Kim et al. Furthermore, it is not obvious to how to modify the two-finger device of Kim et al. so as to add a third

finger, since a third finger is inconsistent with the use of DC voltage as taught by Kim et al. Thus, Kim et al. essentially teach away from the present invention by virtue of the fact that their tweezer is operated by a DC voltage.

Applicant comes at the product from a new prospective, providing three or more fingers, and the use of alternating voltages to operate those fingers. This results in a significantly more sensitive grasper. More particularly, the tips of the tweezers of Kim et al. snap closed once the applied DC voltage reaches a critical value. At that critical voltage, the voltage-distance relationship exhibits a discontinuous step change. Therefore, the tip motion, as actuated by a DC field, is not well controlled. Furthermore, the tips remain closed until a repelling voltage is applied to both tips.

Applicant's use of an alternating current to control three or more fingers offers the significant advantage that the phase rotation avoids the "snapping" effect that Kim et al. describe. Furthermore, the net effect of the time-varying, phased voltage allows each grasping element to be directed toward any point within the plane or volume defined by the three or more grasping elements. Accordingly, claims 2-6, 9-12, 30, 32 and 33 are

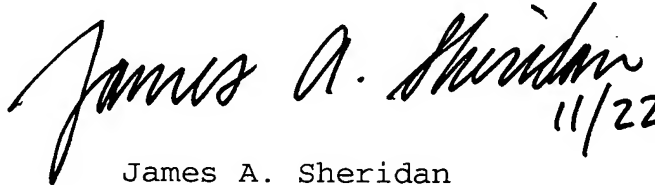


believed to be in condition for allowance, and allowance thereof is respectfully requested.

In addition, Applicant has now added new claims 42 and 43. Inasmuch as new claims 42 and 43 depend either directly or ultimately from independent claim 1, claims 42 and 43 are believed to be in condition for allowance. Accordingly, allowance of claims 42 and 43 is respectfully requested.

In the event that any additional fees may be required in this matter, please charge the same to Deposit Account No. 16-0221.

Respectfully submitted,

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